

Appl. No. 09/833,711
Amdt. Dated 03/30/2005
Reply to Office Action of 03/03/2005

6. (currently amended) A method as claimed in claim ~~[[4]]~~1, wherein said film is deposited in a vacuum chamber whose pressure is maintained by a vacuum pump having a controllable pumping speed, and said total gas pressure is maintained by controlling said pumping speed.

7. (currently amended) A method as claimed in claim ~~[[4]]~~1, wherein said film is deposited at a temperature between 100 and 650°C.

8.(original) A method as claimed in claim 7, wherein said film is deposited at a temperature of about 400°C.

9.(cancelled)

10.(currently amended) A method as claimed in claim ~~[[9]]~~1, wherein said reactive silicon-containing gas is selected from the group consisting of: silicon tetra-chloride, SiCl_4 , silicon tetra-fluoride, SiF_4 , disilane, Si_2H_6 , dichloro-silane, SiH_2Cl_2 , and difluoro-silane, SiH_2F_2 ~~and any other silicon-containing gases involving the use of hydrogen, H, chlorine, Cl, fluorine, F, bromine, Br, and iodine, I.~~

11.(currently amended) A method as claimed in claim 10, wherein said oxidation oxygen-containing gas is selected from the group consisting of: oxygen, O_2 , nitric oxide, NO_2 , water, H_2O , hydrogen peroxide, H_2O_2 , carbon monoxide, CO ~~or~~ and carbon dioxide, CO_2 .

12.(original) A method as claimed in claim 11, wherein said carrier gas is selected from the group consisting of: helium, He, neon, Ne, argon, Ar or krypton, Kr.

13.(currently amended) A method as claimed in claim ~~[[9]]~~1 wherein said ~~raw materials~~ silicon-containing gas is SiH_4 , said ~~oxidation oxygen-containing~~ gas is N_2O , and said carrier gas is N_2 ~~carrier gas~~.

14.(currently amended) A method as claimed in claim ~~[[9]]~~1, wherein the predetermined flow rates of said gases are ~~also controlled~~ selected to optimize the quality of the deposited films after said low temperature treatment.

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Amendments to Claims

Please amend the claims as follows:

- 1.(currently amended) A method of depositing an optical quality silica film on a substrate, ~~comprising:~~
wherein said ~~forming~~ said optical quality silica film is deposited on said substrate by plasma enhanced chemical vapor deposition (PECVD) at temperature between 100 and 650°C in the presence of a silicon-containing gas, an oxygen-containing gas, and a carrier gas, comprising:
 - a) fixing the flow rate of said silicon-containing gas, an oxygen-containing gas, and said carrier gas at predetermined values;
 - b) depositing silica films on said substrate at different total deposition pressures of said gases between 2.0 and 2.6 Torr;
 - c) observing the optical characteristics of the deposited silica films to determine the optimum total deposition pressure;
 - d) depositing said optical quality silica film while controlling said total deposition pressure to said optimum total deposition pressure determined in step c) while controlling the total pressure of said gases; and
 - e) subjecting the ~~as-deposited~~ said deposited optical quality silica ~~ed~~ film to a low temperature treatment between 400° to 1200°C to minimize the presence of contaminant compounds in said film.
- 2.(currently amended) A method as claimed in claim 1, wherein said total pressure is ~~controlled~~ selected to minimize the presence of $\text{Si-O}_x\text{-H}_y\text{-N}_z$ compounds after said low temperature treatment.
- 3.(original) A method as claimed in claim 2, wherein said low temperature treatment is about 800°C.
- 4.(cancelled)
- 5.(currently amended) A method as claimed in claim ~~[[4]]~~ 3, wherein said total gas pressure is about 2.4 Torr.

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15.(currently amended) A method as claimed in claim 13, wherein the flow rates of said gases are ~~also controlled~~ selected to optimize the quality of the deposited films after said low temperature treatment.

16.(original) A method as claimed in claim 15, wherein the flow rate of the SiH_4 is about 0.2 std liter/min.

17.(original) A method as claimed in claim 16, wherein the flow rate of the N_2O is about 6.00 std liter/min.

18.(original) A method as claimed in claim 17, wherein the flow rate of the N_2 is about 3.15 std liter/min.

19.(original) A method as claimed in claim 1, wherein modifiers are incorporated into said films during deposition to modify the resulting refractive index.

20.(original) A method as claimed in claim 19, wherein said modifiers are selected from the group consisting of: Phosphorus, Boron, Germanium, Titanium or Fluorine.

21.(currently amended) A method of depositing an optical quality silica film on a substrate, ~~comprising:~~
wherein—forming said optical quality silica film is deposited on said substrate at a temperature between 100 and 650°C by plasma enhanced chemical vapor deposition (PECVD) in the presence of a ~~raw silicon-containing gas~~ material gas, an oxidation oxygen-containing gas, and a carrier gas, comprising:

a) fixing the flow rate of said silicon-containing gas, an oxygen-containing gas, and said carrier gas at predetermined values;

while controlling the total pressure of said gases to a pressure of between 2.0 to 2.6 Torr; and

b) depositing silica films on said substrate at different total deposition pressures of said gases between 2.0 and 2.6 Torr;

c) observing the optical characteristics of the deposited silica films to determine the optimum total deposition pressure;

d) depositing said optical quality silica film while controlling said total

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deposition pressure to said optimum total deposition pressure determined in step c:
and

e) subjecting said deposited optical quality silica film to a low temperature
treatment ~~subjecting the as-deposited film to a low temperature treatment at about~~
800°C to minimize the presence of $\text{Si-O}_x\text{-H}_y\text{-N}_z$ compounds after said low temperature
treatment.

22.(original) A method as claimed in claim 21, wherein said film is deposited in a
vacuum chamber whose pressure is maintained by a vacuum pump having a
controllable pumping speed, and said total gas pressure is maintained by controlling
said pumping speed.

23.(original) A method as claimed in claim 21, wherein said film is deposited at a
temperature of about 400°C.

24.(currently amended). A method as claimed in claim 21, wherein said ~~raw~~
~~materials~~ silicon-containing gas is SiH_4 , said oxidation-oxygen-containing gas is N_2O , and
said carrier gas is N_2 ~~carrier gas~~.

25.(currently amended) A method as claimed in claim 24, wherein the flow rate of
the SiH_4 is ~~controlled fixed at to be~~ about 0.2 std liter/min, the flow rate of the N_2O is
~~controlled to be fixed at~~ about 6.00 std liter/min., and the flow rate of N_2 is ~~controlled to~~
~~be fixed at~~ about 3.15 std liter/min.

26. (new) A method as claimed in claim 1, wherein said characteristics are the FTIR
spectra.

27. (new) A method as claimed in claim 21, wherein said characteristics are the FTIR
spectra.